King County Tabula: Task 5-Review and Test Tabula Program

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DATE: November 28, 2005

PROJECT NUMBER: 188312.09.05

This memorandum pertains to Work Order #9 of King County Wastewater Treatment Division for revisions and updates to their "Tabula" Cost Estimating Program. Specifically, this memo discusses Task 5, Review and Test Tabula's cost estimating formulas to detect and correct errors. This memo outlines errors found and corrected within the Tabula program and also discusses the general methodology used to test the final results.

During task 1, revision of the unit costs within Tabula, and task 2, identify and add additional cost units, several errors within the existing program were found. Typically, these errors consisted of programming input errors which produced an incorrect value or parameters. These errors were catalogued and corrected during the course of Task 1 and 2 and hard copies of these outputs will be provided to King County in a separate three ring binder. Once Task 1 and 2 were completed, the program was then placed through a systematic testing process was done to check for errors.

To test the pipeline, trenchless technology and tunneling costs a series of inputs for each item was entered in so that every pipe size and type was checked along with the different options for traffic control, dewatering, and utility conflicts costs. A similar process was used for the trenchless technology items so that each cost variable was tested at least once to check for input errors. In addition, quantities for the excavation and backfill were periodically spot checked to make sure the formula outputs were correct.

To check the pump station unit costs parameters from 10 example pump stations was entered into the program and the output checked by hand. Once this was completed the variables for the different items were changed so that the extreme ranges of the program could be checked. A similar process was conducted for the storage unit costs. Storage facilities for 1, 2, 3, 4, 5, 10, 15, 20, 25, and 30 Mgals were tested.

Below is a list of errors and changes made to the existing Tabula Program:

- Manholes: The upper range for the manholes goes up to 144" diameter so that the user can have a 144" diameter pipe and a 144" manhole. It is recommended that in the future

this range be limited so that a 96″ pipe represents the upper range of pipes with a 144″ manhole. Manholes for larger pipes would be custom cast in place structures. The text in the documentation was changed to show that the Tabula program is actually set up to allow for pipes up to 144″ having manholes.

- Pipe Diameters: The outside diameter of a 78″ concrete pipe was incorrect causing an error the quantity calculations. The outside pipe diameter was corrected and the results retested successfully.
- Right of Way: The right-of-way costs presented in the September 2001 Conveyance System Cost Estimate Report and the actual costs in Tabula are different. The Task 1 document shows the actual Tabula program costs for comparison.
- Traffic Control: The increase break in traffic control occurs at the 96″ diameter pipe size not at a 90″ pipe size. The cost values presented in the September 2001 Conveyance System Cost Estimate Report and the actual costs used in the current Tabula program were different. The Task 1 documentation shows the actual Tabula program costs for comparison against the new adjusted costs.
- Utility Conflict: The cost values presented in the September 2001 Conveyance System Cost Estimate Report and the actual costs used in the Tabula program were different. The Task 1 documentation shows the actual Tabula program costs for comparison against the new adjusted costs.
- Microtunneling Costs: The Fixed costs for TBM contained an error for the 36″ microtunnel. The fixed costs used in the program were $150,000 instead of the $250,000 it should have been. This was corrected when the new adjusted values were entered into the program.
- Tunneling Dewatering Costs: The parameters of the range for tunneling dewatering were incorrectly setup with the starting value being 10,000 feet not 1,000 feet. This caused all tunneling less than 10,000 feet to have the minimal dewatering unit costs. These parameters were changed to match the report write-up.
- Pump Stations: Under certain situations the mechanical and architectural adjustment costs based on the depth of excavation and the TDH used to calculate the pump station can be greater than the base mechanical and architectural costs. This can result in an overall negative value for either the mechanical or the architectural costs or even a negative value overall for the pump station. This error has been corrected. As indicated in the Task 1 write up the negative adjustment to the mechanical or architectural has been limited to a maximum of 30% of the base costs. This means the overall mechanical and architectural can not be reduced to more than 70% of the base cost.